

Building international genomics collaborations for global biosecurity

April 6, 2016



The Laboratory's Genome Science Program leverages its technical expertise to assist nations in advancing their genomics and bioinformatics capabilities to reduce health security risks from the spread of dangerous infectious diseases. The work enables cooperative biothreat reduction and scientific engagement on a global scale. The Program has established genome centers with partner institutions in four countries and collaborations with nine additional countries. The journal [*Frontiers in Public Health*](#) published an account of their work.

Significance of the work

Genomics is the study of an organism's complete set of genetic instructions. It is a relatively new scientific discipline, which is fundamental to many approaches to health security. Aided by highly automated Next-Generation DNA Sequencing tools, the field has advanced dramatically during the last decade in the understanding of

genome structure and function of organisms and in medical applications. The Laboratory team's focus of international scientific engagement delivers molecular genomics-based scientific approaches and training for pathogen detection, characterization, biosurveillance and disease mitigation. The Program aims to enable a global network to reduce infectious disease risk and improve compliance with international guidelines, such as the International Health Regulations from the World Health Organization. A scientific approach using next-generation sequencing-enabled genomics research promotes global health security. Development of genome centers in many countries can help local public-health authorities identify and monitor disease outbreaks. Samples can be analyzed locally, without having to ship them long distances. A network of genome centers enhances global biosurveillance at high temporal, geographic and information resolution. This development provides the needed genomic data to improve the speed and accuracy of outbreak detection and monitoring and to enable coordinated mitigation actions. Thus, a cooperative network can reduce the global threat from these pathogens.

Achievements

Los Alamos has been a leader in genomics since the early 1980s and is now leveraging its capabilities to provide support to partner countries in developing molecular genomic-based capabilities. The team has established genome centers with four partner institutions in the Republic of Georgia, Kingdom of Jordan, Uganda and Gabon. These genome centers are provided with a standardized sequencing platform, standard operation and good laboratory practice protocols, bioinformatics analysis tools and associated computational hardware. Laboratory scientists travel to each site and assist with setup and configuration of laboratory equipment and computational resources. They also provide on-site training for laboratory techniques and bioinformatics. The team guides the partners to perform sequencing runs on the newly provided equipment while they are on-site. In addition to establishing the genome centers, the LANL team provides training and engages in collaborative research with other institutions that have Next-Generation DNA Sequencing capabilities or are on the path to acquire it. This type of collaboration has occurred in nine countries. It enables the partners to broaden international collaboration networks and to exercise and enhance local capabilities. These collaborations bring together complementary skill sets and resources, benefiting participating parties and promoting improved global health.

The research team

Authors of the publication include Helen H. Cui, Tracy Erkkila, Patrick S. G. Chain and Momchilo Vuyisich of LANL's Bioenergy and Biome Sciences group. The U.S. Defense Threat Reduction Agency Cooperative Biological Engagement Program; U.S. Department of State Biosecurity Engagement Program; United Kingdom Global Partnership Programme; and Foreign Affairs, Trade and Development Canada Global Partnership Program funded the activities. The work supports the Lab's Global Security mission area and the Science of Signatures science pillar through the development of scientific partnerships and sustainable technical capacity to address complex global health security challenges. *Caption for image below: Distribution of genome centers and collaborations are shown. Red marks indicate genome centers established by the*

program. Yellow marks note countries that are in collaborations focusing on training and research.

Los Alamos National Laboratory

www.lanl.gov

(505) 667-7000

Los Alamos, NM

Operated by Los Alamos National Security, LLC for the Department of Energy's NNSA

